US005785792A

United States Patent [19]

Locke et al.

[11] **Patent Number: 5,785,792**

[45] **Date of Patent: Jul. 28, 1998**

[54] **METHOD FOR MAKING A DECORATIVE PANEL FOR USE IN SCREEN DOORS, WINDOWS, AND SIMILAR STRUCTURES**

[75] Inventors: **Albert C. Locke**, Gardena; **Oscar Schoenfeld**, Beverly Hills, both of Calif.

[73] Assignee: **Academy Manufacturing Co., Inc.**, Gardena, Calif.

[21] Appl. No.: **730,776**

[22] Filed: **Oct. 16, 1996**

Related U.S. Application Data

[62] Division of Ser. No. 410,972, Mar. 27, 1995, abandoned.

[51] **Int. Cl.**[6] **B32B 31/00**; B41M 1/26; B05D 5/00; B41C 1/14

[52] **U.S. Cl.** **156/247**; 156/277; 427/243; 101/128.4

[58] **Field of Search** ..... 160/371, DIG. 7; 40/621, 616; 101/129, 128.21, 128.4; 156/247, 277; 427/243, 247

[56] **References Cited**

U.S. PATENT DOCUMENTS

243,962	7/1881	Palmer	160/DIG. 7
2,281,635	5/1942	Strauss	160/DIG. 7
2,624,967	1/1953	Phillippi	101/129 X
3,017,927	1/1962	Demko	160/DIG. 7
3,577,915	5/1971	Thompson et al.	
5,518,803	5/1996	Thomas	428/195
5,525,177	6/1996	Ross	156/240
5,534,098	7/1996	Kerle	156/230

Primary Examiner—David A. Simmons
Assistant Examiner—J. A. Lorengo
Attorney, Agent, or Firm—Freilich, Hornbaker & Rosen

[57] **ABSTRACT**

A panel for use in a screen door comprising an air permeable essentially visually transparent substantially open mesh material bearing a layer of plastic material thereon forming a decorative pattern.

6 Claims, 4 Drawing Sheets

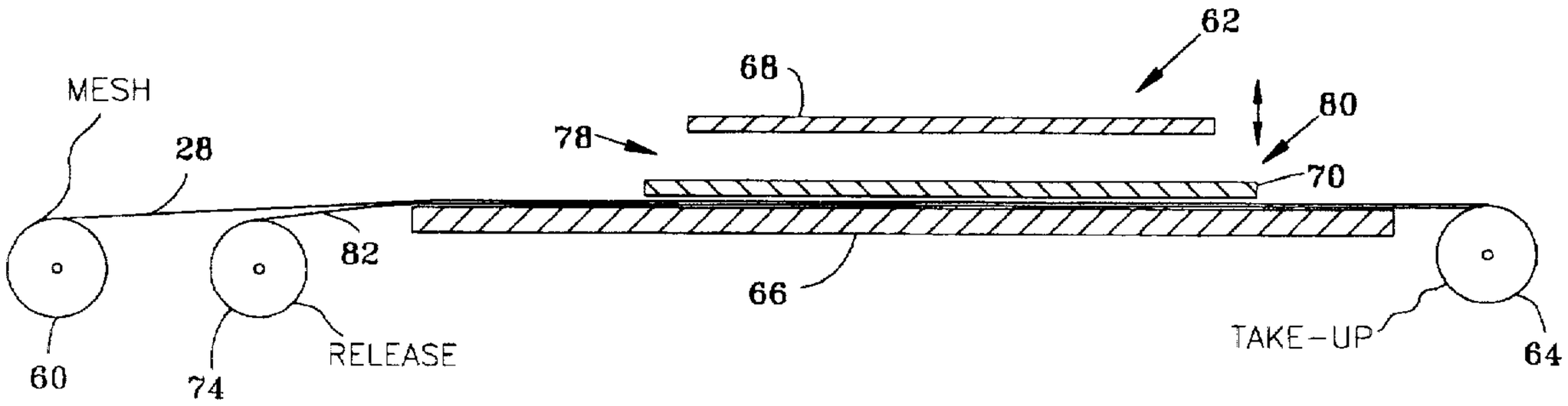
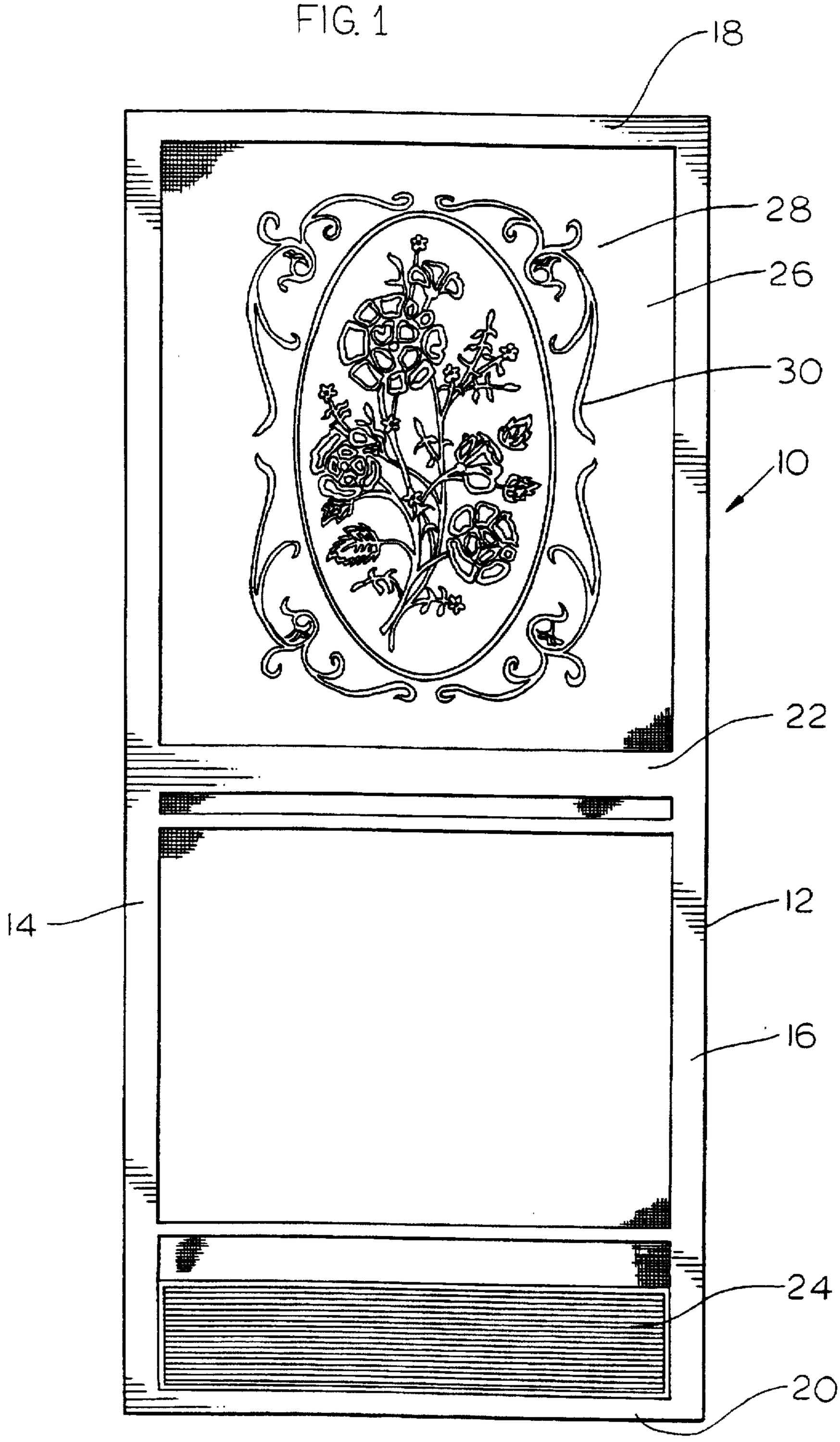


FIG. 1



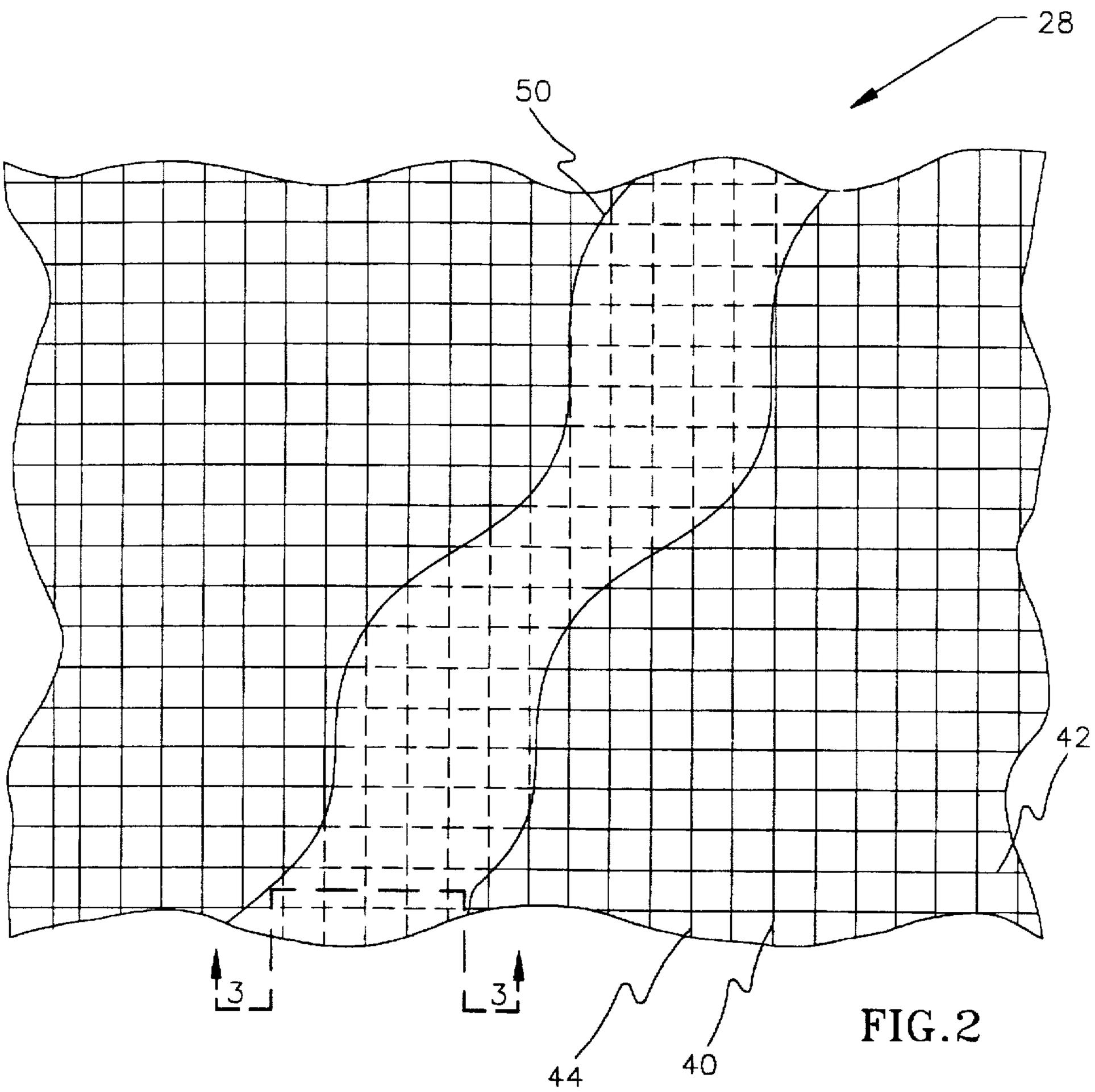


FIG.2

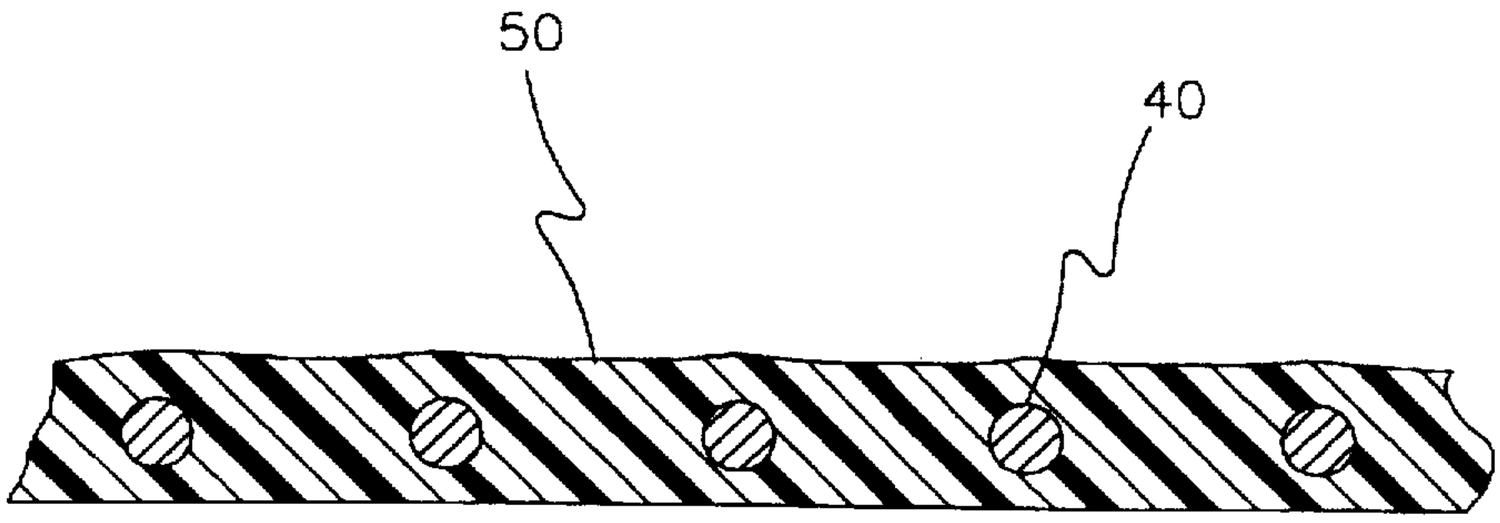


FIG.3

FIG.4A

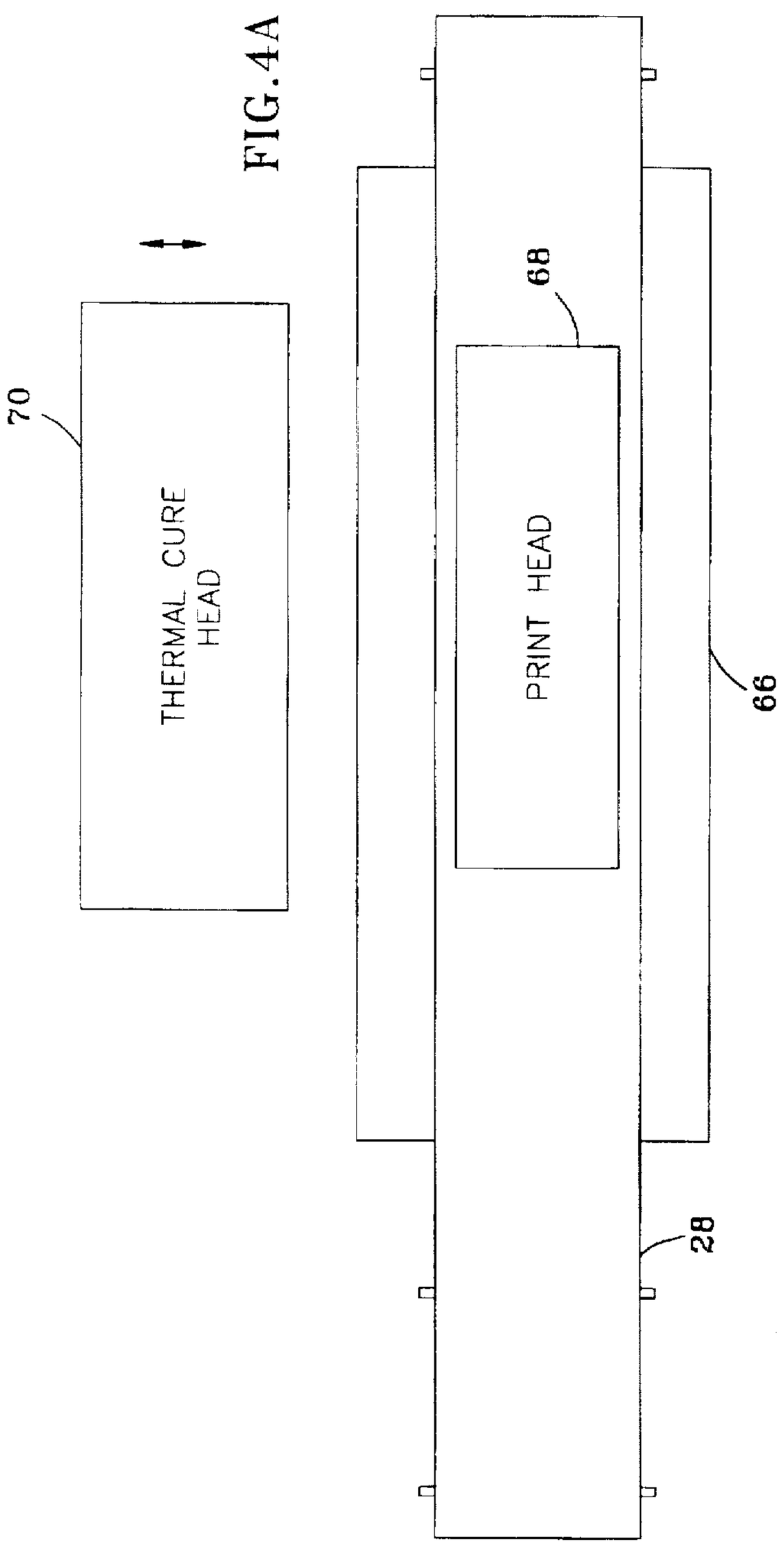
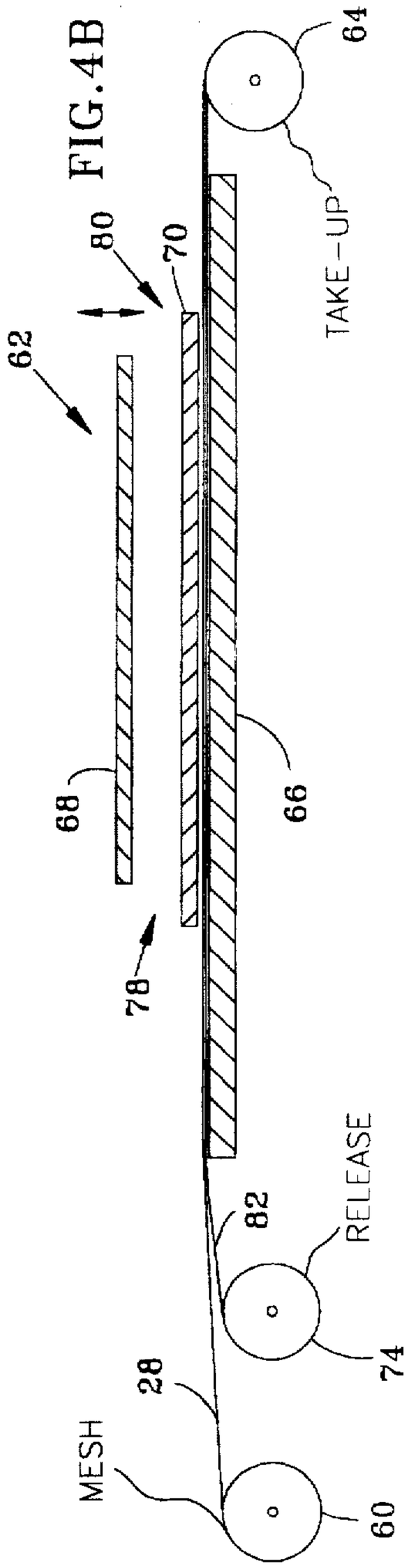

70
THERMAL CURE HEAD
68
PRINT HEAD
66
28

FIG.4B


64
TAKE-UP
80
70
62
68
66
78
82
RELEASE
74
28
MESH
60

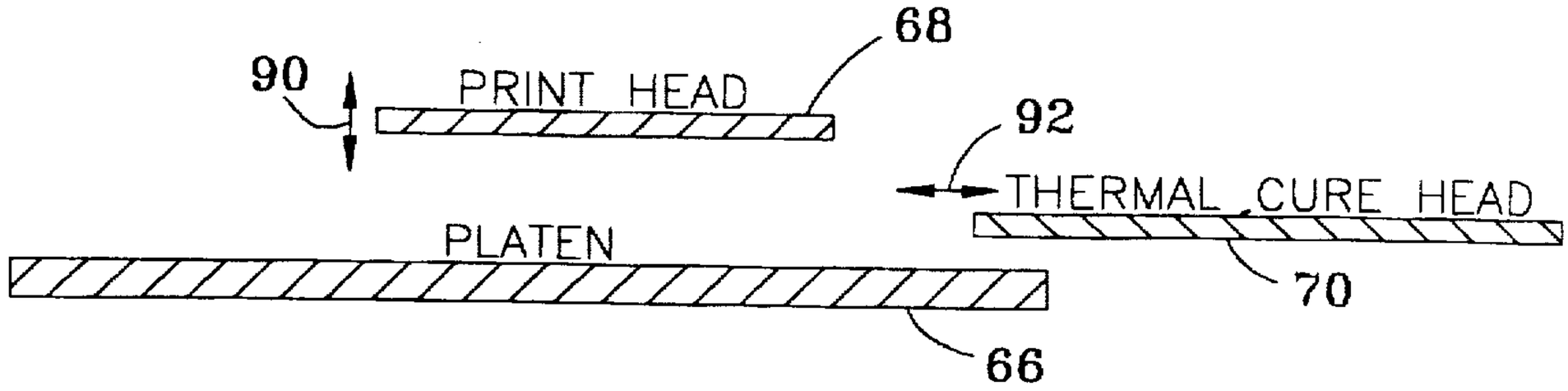


FIG.5A

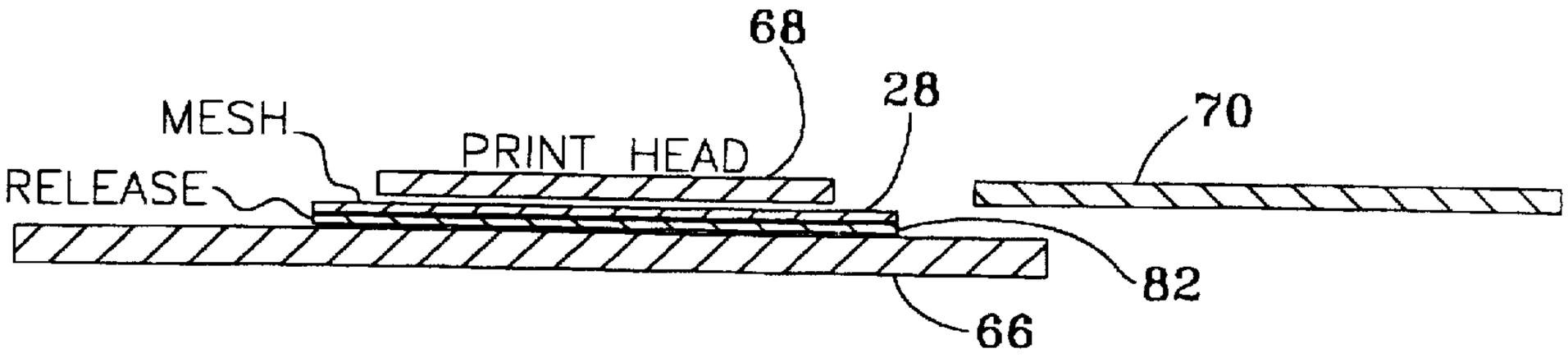


FIG.5B

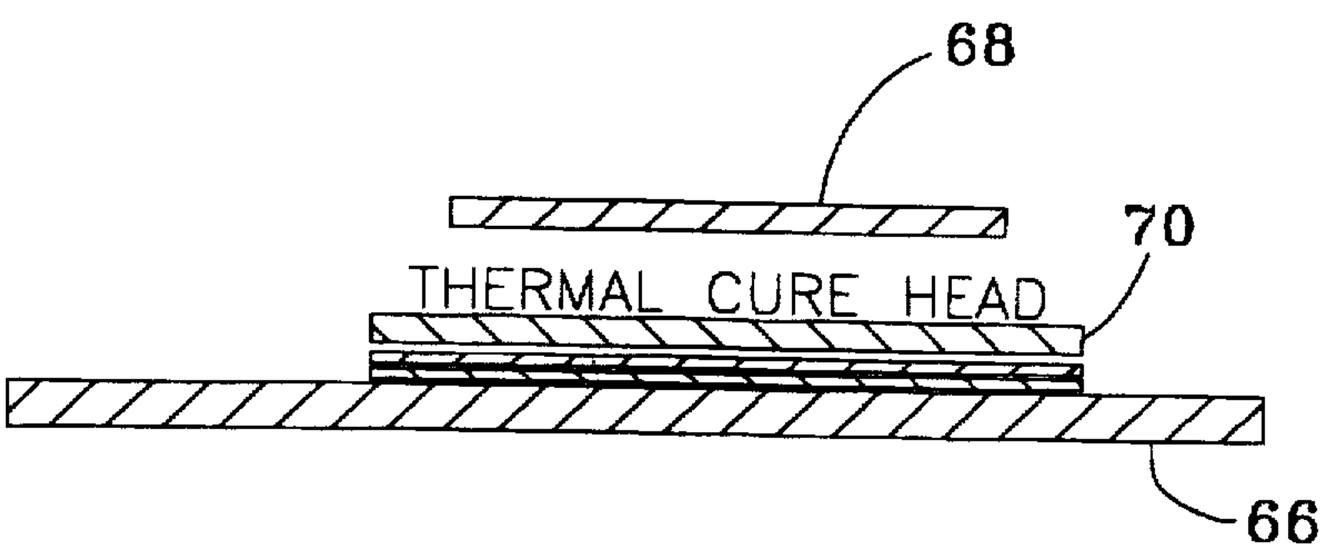


FIG.5C

METHOD FOR MAKING A DECORATIVE PANEL FOR USE IN SCREEN DOORS, WINDOWS, AND SIMILAR STRUCTURES

This application is an Divisional of U.S. patent application 08/410,972, filed Mar. 27, 1995 now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to decorative, air permeable, visually transparent panels for use in screen doors and the like and to a method of manufacture thereof.

Screen doors and the like, e.g., window screens, are widely used in residential and commercial buildings for providing a visually transparent opening and allowing air flow therethrough while preventing insect entry. Such screen doors typically include a substantially rigid frame defining an open area and a panel of flexible substantially open mesh material stretched across that area. The mesh material is typically formed of orthogonal fibers, e.g., aluminum or fiber glass, which are spaced substantially uniformly in both directions to define a matrix of rectangular openings. For example, a mesh material widely used in screen doors employs fibers having a diameter of 0.011 inches with 18 vertical (WOOF) and 16 horizontal (WARP) fibers per inch. These parameters define a substantially open mesh (i.e., more than 50% open) thus affording good visual access and air permeability. The resulting mesh openings, e.g., approximately 0.05 inch square, are sufficiently small to define an effective boundary against most flying insects.

Prior art attempts to apply decorative patterns to mesh material have included painting a pattern on the surface of the mesh material fibers. Such a procedure does not produce an aesthetically pleasing result. Another attempt (e.g., U.S. Pat. No. 314,483) involves fully covering the mesh material with a solid film and then applying the decorative pattern to the film. This approach would not be useful in connection with screen doors which necessitate that the mesh material be air permeable and visually transparent.

SUMMARY OF THE INVENTION

The present invention is directed to a panel suitable for use in a screen door comprised of an air permeable, visually transparent, substantially open mesh material bearing a decorative pattern affixed thereto.

In a preferred embodiment, the panel is comprised of flexible mesh material formed of intersecting fibers dimensioned and spaced to define a matrix of mesh openings, which openings comprise at least 50% of the material area. A substantially planar layer of plastic material, defining a decorative pattern, is affixed to the mesh material with the plastic material at least partially surrounding portions of multiple ones of the fibers. The plastic material is preferably solid and thus non-permeable to air but the decorative pattern typically occupies only a small percentage of the panel thus retaining the panel's essential characteristics of air permeability and visual transparency.

More particularly, the invention is directed to a screen door having a substantially rigid frame defining an open area bridged by a panel of substantially open mesh material bearing a layer of plastic material thereon forming a decorative pattern.

In accordance with a preferred method of manufacture, successive panels of mesh material (which can be in continuous web form) are moved through a print station between a print head and platen. A layer of release material,

e.g., a treated smooth surface paper, is placed between the mesh material and the platen. The print head is preferably capable of dispensing a thermal setting plastic ink through a fine printing screen and stencil system onto the open mesh material. After the plastic ink is deposited onto the mesh material against the release material, it is thermally cured in place. This leaves a set layer of plastic material secured to the mesh material. After peeling away the release material, the mesh material is mounted in a screen door frame in a conventional manner.

BRIEF DESCRIPTION OF THE FIGURES

FIG. **1** is a front plant view of a screen door in accordance with the present invention incorporating a decorative panel of large mesh material;

FIG. **2** is an enlarged view showing a typical portion **2—2** of the decorative panel of FIG. **1**;

FIG. **3** is a sectional view taken substantially along the plane **3—3** of FIG. **2**;

FIGS. **4A** and **4B** are respectively top plan and side section views schematically representing an apparatus for producing decorative panels in accordance with the invention;

FIGS. **5A**, **5B**, **5C** respectively schematically depict steps employed to manufacture panels in accordance with a preferred embodiment of the invention.

DETAILED DESCRIPTION

Attention is now directed to FIG. **1** which illustrates a screen door **10** comprised of a substantially rigid frame **12**. As depicted, the frame **12** is comprised of vertical stiles **14**, **16** bridged by upper and lower horizontal cross members **18**, **20**. As depicted, the door **10** also includes one or more intermediate cross members **22** connecting the stiles **14**, **20**. Also depicted is a kick plate **24** which is mounted immediately above the lower horizontal cross member **20**.

The frame members define one or more open areas, e.g., 26 which normally accommodates a panel of substantially open (i.e., more than 50% open) mesh material 28 which is characterized by being air permeable and essentially visually transparent. A mesh material typically used for screen door applications is formed of orthogonal fibers, e.g., aluminum or fiber glass, which are spaced substantially uniformly in vertical and horizontal directions to define a matrix of rectangular mesh openings. For example, a mesh material widely used in screen doors employs fibers having a diameter of 0.011 inches with 18 vertical and 16 horizontal fibers per inch. The resulting mesh openings, e.g., approximately 0.05 inch square, are sufficiently small to constitute an effective boundary against flying insects.

The present invention is concerned with forming a decorative pattern **30** on the mesh material **28** to enhance the door's aesthetic appearance and yet not diminish its functionality. In accordance with a preferred embodiment of the invention, the decorative pattern **30** is formed by depositing an essentially planar layer of plastic material on the mesh material **28**.

More particularly, with reference to FIG. **2**, the mesh material **28** is formed by a plurality of vertical fibers **40** which intersect or cross over horizontal fibers **42**. So oriented, the fibers **40**, **42** form a matrix of rectangular openings **44**. The present invention is concerned with mesh material **28** in which the openings **44** constitute greater than 50% of the area of the material thus providing sufficient air permeability and visual transparency to satisfactorily function in a screen door application.

In accordance with the preferred embodiment, an essentially planar layer of plastic material **50** is deposited on the mesh material **28** embedding, at least partially, portions of the fibers **40**, **42**. The plastic material **50** so deposited forms the decorative pattern **30** depicted in FIG. **1**. FIG. **3** is a cross-section taken substantially along the plane **3—3** of FIG. **2** showing the plastic material **50** deposited on the fibers **40**. Although the plastic material **50** is opaque and not air permeable, it occupies only a relatively small portion of the mesh material area and thus does not measurably diminish its air permeable and visually transparent characteristics.

FIGS. **4**A and **4**B illustrate a preferred apparatus for depositing the plastic material **50** on the mesh material **28**. More particularly, FIGS. **4**A and **4**B depict a supply roll **60** of mesh material **28** positioned to be pulled through a print station **62** by a driven take up roll **64**. The print station **62** is essentially comprised of a stationary platen **66**, a movable print head **68**, and a movable thermal curing head **70**. As will be discussed hereinafter, the print head **68** and thermal curing head **70** are sequentially moved into position adjacent the mesh material **28** above the platen **66**. FIGS. **4**A and **4**B also depict a supply roll **74** of a treated smooth surface release material e.g., paper. Note that supply rolls **60** and **74** are mounted proximate to the entrance **78** of print station **62**, whereas take up roll **64** is mounted adjacent the exit **80**. The release material **82** supplied from roll **74** extends between the mesh material **28** and the platen **66**.

FIG. **5**A schematically depicts the print head **68** and thermal cure head **70** in a rest or start position relative to the platen **66**. The print head **68** is mounted for movement represented by arrows **90**, toward and away from platen **66**. Cure head **70** is also mounted for movement, represented by arrows **92** into position adjacent platen **66**.

FIG. **5**B depicts the print step in which the print head **68** moves close to the platen **66** sandwiching the mesh material **28** and release material **82** therebetween. The print head **68** is substantially conventional and is comprised of a fine printing screen and an opaque stencil. When in the print step depicted in FIG. **5**B, a thermal setting plastic ink is dispensed from the print head **68** flooding onto the mesh material **28** and therethrough against the release material **82**. Suitable thermal setting plastic inks are readily commercially available as are printing systems for controllably dispensing the plastic ink through the print head **68**.

After the plastic ink is deposited on to the mesh material **28** and against the release material **82**, as represented in FIG. **5**B, the print head is moved away from platen **66** and the thermal cure head **70** moves into position above the platen **66**. The thermal cure head then applies sufficient heat to set the deposited plastic material **50**. Thereafter, the apparatus is returned to its rest or start position depicted in FIG. **5**A.

As shown in FIG. **4**B, the mesh material **28** and release material **82** are preferably taken up on the same roll **64**, although of course separate take-up rolls could be used. In any event, the release material and mesh material are preferably peeled apart prior to final assembly into a door **10**.

In an exemplary preferred embodiment, the print area defined by the print head **68** is approximately 3 feet wide and 7 feet long. The thermal cure head is preferably slightly larger to assure sufficient heating for setting the plastic ink. Different types of ink can be used, but a preferred form comprises Willflex Gold TF #85570 and White 1C714 HPLF, a plastic screen printing ink marketed by Flexible Products Company of Marietta Ga. The plastic material formed on the mesh material **28** typically has a thickness on the order of 1/16 inch.

Although only a single print station has been shown in FIGS. **4** and **5**, it is pointed out that multiple print stations could be provided to simultaneously print along multiple regions of the mesh material web. Alternatively, the multiple print stations can be used to respectively apply different colors of plastic ink to produce multiple color decorative patterns.

From the foregoing, it should be appreciated that applicants have disclosed herein a decorative panel suitable for use in a screen door and the like which aesthetically enhances the end product without measurably diminishing its air permeable and visually transparent characteristics. It is recognized that various modifications to the disclosed apparatus and method will occur to those skilled in the art and it is intended that any such modifications, variations, and equivalents be encompassed by the scope of the appended claims.

We claim:

1. A method of manufacturing a decorative, air permeable, visually transparent panel suitable for use in screen doors, windows, and similar structures comprising the steps of:

positioning a sheet of intersecting fibers defining at least a 50% open mesh between a print head and a platen;

positioning a smooth surface release sheet between said mesh sheet and said platen;

operating said print head to deposit a plastic layer on said mesh sheet, and therethrough to said release sheet, to form a decorative pattern; and

peeling said release sheet away from said mesh sheet.

2. The method of claim **1** wherein said print head is operated to flow thermal setting plastic ink onto said mesh sheet and therethrough to said release sheet; and

applying heat to said plastic ink to form a planar layer of plastic material at least partially surrounding portions of multiple ones of said fibers.

3. The method of claim **1** further including the step of mounting said sheet in an open area of a screen door frame.

4. A method of manufacturing a screen door having a decorative, air permeable, visually transparent panel comprising the steps of:

feeding a web of mesh material of intersecting fibers defining at least a 50% open mesh along a path between a print head and a platen;

feeding a web of release material having a smooth surface along a path between said mesh material web and said platen;

periodically stopping movement of said mesh material web and release material web;

operating said print head while said movement is stopped to deposit a plastic layer on said mesh material web, and therethrough to said release material web, to form a decorative pattern;

mounting a portion of said mesh material web in an open area of a screen door frame; and

peeling release material from said portion of mesh material.

5. The method of claim **1** wherein said print head is operated to flow thermal setting plastic ink onto said mesh sheet and therethrough to said release sheet; and

applying heat to said plastic ink to form a planar layer of plastic material at least partially surrounding portions of multiple ones of said fibers.

6. The method of claim **4** including the further step of winding said web of mesh material onto a take-up roll.

* * * * *